Nutritional intake of Opioid Replacement Therapy Patients in Community Pharmacies: A Pilot Study

Abstract

Aim Opioid Replacement Therapy (ORT) is an established therapy for a patient group that has been associated with nutrition related co-morbidities. This paper aims to assess the nutritional intake and supplementation in ORT patients, determine the extent of nutritional/dietary advice supplied to ORT patients, and to briefly examine patients' perception of pharmacists' provision of nutritional advice.

Methods The nutritional intake of ORT patients receiving treatment in community pharmacies within the Australian Capital Territory was assessed via a 24-hour-recall survey. Food intake data was analysed via nutrient analysis software and compared to Australian Nutrition Reference Values and the nutrient intakes of the Australian population. Patients were surveyed to determine supplement use and perceptions of nutritional advice gained by pharmacists.

Results Potential insufficient intake of various macronutrients and micronutrients was observed in both sexes. Less then 25% of patients recorded supplement use. Fifteen percent of males and 21% of females stated that they had approached a pharmacist with a nutrition related query. All patients who received nutritional advice followed the advice.

Conclusions ORT patients dosing at community pharmacies appear to have poor nutritional intake. ORT patients appear to be receptive to pharmacist's advice. Community pharmacists can potentially increase the beneficial health outcomes in this population through the proactive supply of accurate nutritional advice.

Introduction

Opioid Replacement Therapy (ORT) has been an established therapy for over 45 years for a patient group that is associated with numerous nutrition related co-morbidities.[1,2,3] A 2008 study found that the incidence of malnutrition among opioid addicted individuals varied from 5% to 30% and severe underweight status was prevalent among drug dependent women.[1] Body Mass Index (BMI) measurements in these patients have also been shown to be significantly lower when compared to the general population.[3] These findings have been related to poor health outcomes for these individuals and are likely a result of insufficient intake of essential vitamins, minerals and macronutrients which may be preventable through appropriate dietary advice or nutrient supplementation.[2,3] The majority of ORT patients are in contact with pharmacy staff on a daily basis therefore allowing opportunities for pharmacists to offer nutritional counselling and advice.[4]

Studies by Szpanowska-Wohn *et al*[5] (n=48) and Kolarzyk *et al*[6] (n=30) used tools such as BMI and skin fold measurements to estimate nutritional status in non-pharmacy (Government-run treatment facility) treated ORT patients but did not directly assess intake of nutrients. Kabrt *et al*[7] used these same methods, also assessed the subjective feeling of patients and examined prealbumin, albumin, aminotransferase and transferrin levels. The authors did not assess nutrient intake through food consumption or supplementation of any kind. A similar study by Szpanowska-Wohn *et al*[8] (n=44) used the same methods as Szpanowska-Wohn *et al*[5] and Kolarzyk *et al*[6] and also bioelectric impedence, to evaluate nutritional status in non-pharmacy treated ORT patients. Each of these studies found that individuals had

a higher rate of poor nutritional status but again, they did not examine specific nutrient intake and therefore potential insufficiencies.

To evaluate actual nutrient intake in individual patients, the 24-hour recall method of assessing dietary intake has been validated.[13-15] Four studies reported a 24-hour recall method to assess the energy and nutrient values of daily food intakes in ORT patients. Zador *et al*[9] (n=86) examined intake in only female patients concluding that these individuals have a higher than usual contribution to energy by sugars. Szpanowska-Wohn *et al*[10] (n=42) investigated percentage daily intake of macronutrients and found a wide distribution of food consumption in non-pharmacy treated ORT patients. Szpanowska-Wohn *et al*[11] (n=48) and Kolarzyk *et al*[12] (n=30) used the recall method to evaluate macronutrient, vitamin and mineral intake changes before, during and after 4 years of methadone treatment in a university treatment facility. This research illustrated that both men and women displayed potential insuficiencies in energy intake, macronutrients other than protein, vitamins, and minerals.[12] None of these studies investigated patients' use of vitamin or mineral supplements.

In research published prior to 1993, Morabia *et al*[16] (n=38) examined the nutritional intake of opioid dependent individuals (participants in this study were not necessarily on ORT) through a history questionnaire and concluded that individuals had a high intake of alcohol dense foods and low nutrient density foods. A study by Gambera and Clarke[17] (n=40) examined intake of patients on a methadone maintenance program through a 24-hour-recall and compared these to the Recommended Dietary Allowances. Although these guidelines have since been revised and the results from

this study are therefore non-comparable, the authors did conclude that patients showed deficiencies and had a need for nutritional counseling.

The majority of literature investigating nutrition in this patient group within the last 10 years is from Eastern Europe. None of the literature has described any interventions by pharmacists or other health professionals to intervene to improve the nutritional status of ORT patients. [5-12]

The current study aimed to assess the nutritional intake and vitamin supplementation of ORT patients through 24-food-recall interviews and briefly examine ORT patient's perceptions of pharmacist provided nutritional advice and recommendations.

Methods

Approval for this project was given by [Removed for blind peer review]

Participants were recruited from 5 community pharmacies providing ORT within the Australian Capital Territory. The approached pharmacies were invited to participate by providing access to their ORT patients and were provided with information outlining the project. ORT patients were then individually approached by the primary researcher (FW) and verbally informed of the project during their normal daily visit to the pharmacy. All participants provided written informed consent. Recruited patients were required to take part in the interview directly following recruitment in order to avoid any changes in patient eating pattern prior to the survey. The protocol specifically excluded pregnant women and individuals under the age of 18 years as these patients have different nutritional requirements.

Nutritional intake for each ORT patient was recorded during a face-to-face interview with a researcher (FW) via a 24-hour food recall questionnaire modified to enable recording of each patient's identification number from the University of Cambridge EPIC-Norfolk nutritional survey method.[18] The recall questionnaires utilised the multiple pass method (modelled on the United States Department of Agriculture 5-step multiple pass method[19]) and required patients to list all food and drink consumed with the last 24 hours. Patients were required to specifically state brand names and estimate serving sizes of all food listed wherever possible during the recall questionnaire and include use of condiments, sugar and discretionary salt. All interviews were conducted on Fridays and patients were asked if this intake was typical of their normal eating patterns.

During the same face-to-face interview, ORT patients were asked whether they use, or have used, vitamin supplements to assist with nutritional insuficiencies. Supplement usage was defined as regular use >3 times per week, throughout the last 2 months. Patients were also asked if they had obtained any nutritional advice or recommendations from a community pharmacist through either the pharmacist volunteering or the patient seeking information. If advice had been obtained from a community pharmacist, the type of advice (eg. specific changes or vitamin recommendation) and the frequency of the advice given were recorded.

Food intake data was analysed using the FoodWorks® (v7)[20] nutrient analysis software program to assess each individual's intake of alcohol, moisture, fibre, cholesterol, macronutrients (carbohydrates, proteins, fats), vitamins (A, C, E, riboflavin, folate, thiamin), and minerals (sodium, potassium, calcium, iron, zinc,

iodine, magnesium, phosphorus). Macronutrient values were used in combination with the Atwater factors to calculate an estimate of each individuals energy intake. The food nutrient databases utilised by FoodWorks® were NUTTAB2010 which included over 2500 foods for nutrient breakdowns analysis.

Currently, it is not known whether ORT patients require different nutritional intake compared to the rest of the population. As such, daily intake of individuals was compared Australia's Nutrient Reference Values (NRV).[21] Estimated total energy requirements (the average dietary energy intake that is predicted to maintain energy balance in a healthy adult of defined age, gender, weight, height and level of physical activity [EER]) for a sedentary reference body weight male (76kg) and a sedentary reference body weight female (61kg) aged 19 to 50 years of 10800kj and 8100kj respectively, were used for daily energy intake comparisons.[21] Sedentary activity levels were chosen as this allowed for the most easily attainable daily kilojoule requirement. For vitamin and mineral comparisons, estimated average requirements (daily nutrient level estimated to meet the requirements of half the healthy individuals in a particular life stage and gender group [EAR]) were used for the vitamins A and C, thiamin, riboflavin, niacin and folate, and the minerals magnesium, calcium, phosphorus, iron, zinc and iodine.[21] Adequate intakes (the average daily nutrient intake level based on observed or experimentally-determined approximations or estimates of nutrient intake by a group or groups of apparently healthy people that are assumed to be adequate [AI]) were used for comparisons of fibre, potassium and range of sodium intake.[21] These reference values allowed for the most easily achievable intake for patients.

Mean daily nutrient intakes of ORT patients were compared to results from the 2011-

2012 Australian National Nutritional and Physical Activity Survey (NNPAS). Mean intakes from both sexes aged 19-50 years were compared to the results obtained in this study.

Descriptive statistics were used to determine the variations from the NRV ranges and the results from the intake analysis. These data were used to estimate a need for supplementation in these patients and compared to any declared supplement intake. Continuous variables were described with mean and range. Categorical variables were expressed as percentage of frequency.

Results:

A total of 75 ORT patients were approached in 5 community pharmacies in the ACT. Patients were aged between 18 and 50 years. Nine patients declined to participate resulting in 66 ORT patients (50% male) completing the 24-hour recall and survey.

Macronutrient Intake

Total energy intake for both females and males was below the estimated energy requirement for sedentary individuals of the reference weights in 10 (30%) patients (Table 1). Mean protein intake for males was 135.9g with 31 (94%) patients consuming an amount in excess of the EAR daily protein intake of 52g. Females also displayed intake of protein above the EAR (46g) with a mean intake of 78.1g. Patients of both sexes displayed potential insufficiencies in fibre intake with all females and 32 (97%) males consuming below the AI. Intake of water was also lacking with 30 (91%) females and males consuming below the AI.

Vitamin Intake

Twenty five (75%) females displayed potential insufficient intake of vitamins E and folate (Table 2). Of the females surveyed, 18 (55%) and 20 (61%) patients recorded intakes below the EAR of vitamin A and thiamin, respectively. Riboflavin appeared to be the only vitamin consistently consumed at levels above the EAR of 0.9mg with the mean intake at 1.9mg and 27 (82%) females recording above the EAR.

Generally, a lower percentage of male patients appeared to be consuming insufficient levels of vitamins. Intake of thiamin, riboflavin and vitamin C were consistently consumed at levels above the EAR with 20 (60%) of males recording above the target requirement. Thirty-two (97%) male patients however, had a mean intake below the adequate intake of vitamin E. Intake levels of vitamin A and folate were also below the target ranges in 20 (60%) of patients.

Mineral Intake

Of the minerals examined, sodium and phosphorus appeared to be consumed in the greatest amounts with 26 (79%) females and 33 (100%) males above the adequate intake (Table 3). Males appeared to have an exceedingly high intake of sodium with a mean intake recorded at 3878.6mg. Potassium intake was below the adequate intake in 22 (67%) females and 25 (76%) males, as was magnesium in 18 (55%) females and males. Both calcium and iron intake were below EAR in the majority of females (24 (73%) and 23 (70%) patients respectively). Comparatively, only 15 (46%) and 10 (30%) males were recorded as consuming below the EAR for these two minerals, respectively. Both iodine and zinc were consumed above the EAR in greater than 14

(40%) individuals of both sexes.

Supplement Use

Females stated in 9 (27%) cases that they were regularly taking a vitamin or mineral supplement. The most commonly utitlised supplements were multivitamins and iron tablets, each accounting for one third of supplements used. Conversely, only 6 (18%) males indicated that they regularly used supplements, with multivitamin tablets accounting for 5 (83%) of those used.

A total of 5 (15%) males and 7 (21%) females stated that they had approached a pharmacist with nutrition related issues or questions. No patient reported that they had received advice or information regarding nutrition from a pharmacist without the patient initiating a request for advice. Common pharmacist advice as included the recommendation of multivitamins, iron supplements or kilojoule dense supplements for low BMI patients. All advice given by pharmacists was perceived as appropriate from the patient's view and all patients who received nutritional advice from a pharmacist stated that that they followed any nutritional advice provided to them.

Discussion

This pilot study provides data to show irregularities in energy gained from macronutrients and insufficient intake of vitamins and minerals across both sexes in ORT patients. On comparison with results from the 2011-2012 Australian National Nutritional and Physical Activity Survey (NNPAS) the nutrient intake abnormalities described in this paper appear to be distinct to this population group[39].

It was found that protein intake was high while energy, dietary fibre and moisture intake for both sexes of ORT patients were below the EAR and AI in numerous individuals interviewed. Low energy intake can impair functions such as cell metabolism, synthesis and metabolism of enzymes and hormones and ongoing functioning of muscles including the heart, and brain function.[21] Low energy intake in this group of individuals may be due an excessively sedentary lifestyle or concurrent use of illicit drugs, which suppress appetite and therefore also energy intake. Low intake may also be a result of poor oral and dental health that hinder regular consumption of foods. Research has shown addicts to have more than twice the number of absent, rotten, extracted and traumatized teeth than controls.[22] Other contributing factors may include a lower socioeconomic status of these patients leading to cost-led food choices, of less nutrient dense foods.[23] When directly compared with the NNPAS results, both sexes appeared to record daily energy intakes of considerably less than the Australians aged 19-50 years.[39] The NNPAS recorded mean energy intakes of 10611.8kj and 7701.38kj for males and females respectively, significantly higher than the results of male and female ORT patients with mean daily energy intakes of 7428.3kj and 4331.2kj respectively.[39]

Mean fibre and moisture intakes of both male and female ORT also patients appear to be considerably lower than the intakes recorded by the general Australian public.[39] Mean fibre and moisture intakes of male and female ORT patients were recorded at 13.3g and 9.8g and 1906.9mL and 1543.6mL respectively. Results from the NNPAS listed mean fibre intake for males at 24.6g and females at 20.5g. Mean moisture intake was recorded at 3342.7mL for males and 2689.9mL for females.[39] Low daily intake of both fibre and moisture may exacerbate symptoms of constipation commonly experienced by methadone patients and is supported by previous findings

by Zador *et al.* who found low fibre intake in female patients on methadone maintenance therapy.[9,24]

Alcohol intake was found to be low with the majority of patients (83%). Patients who did record alcohol consumption however, were found to be above the recommended intake of less than or equal to 5% of daily energy.

A high percentage of females had potentially insufficient intake of vitamins E and folate. Comparatively, male patients showed potential insufficient intakes of vitamins A, E and folate. Each of these vitamins is essential for adequate human health.
The various forms of vitamin A are required to maintain the integrity of epithelial cells throughout the body and to maintain neural signaling for vision.[21,25] Adequate vitamin A levels are also linked to immune system function, particularly important for this patient group which has been associated with increased risk of HIV and other health problems.[21,26] In both sexes of ORT patients, the mean recorded daily vitamin A intake appears to be considerably less than that of the Australian population. Results from the NNPAS included mean daily vitamin A intake at 846.2ug and 773.1ug for males and females respectively.[39] Comparatively, the mean daily vitamin A intake of ORT patients was lower at 702.1ug for males and 552.1ug for females.[39]

Maintaining appropriate serum calcium concentrations plays a significant role in bone health.[21] This is of particular importance in this patient group as studies have associated ORT with increased osteoporosis risk.[27,28] Kim *et al*. found that over 75% of patients on a methadone program had low bone mineral density and Grey *et al.* recorded reduced bone mineral density in men on methadone therapy.[27,28] Low

calcium intake was also recorded in females and is of particular significance as women are at a higher risk of osteoporosis.[28] When compared to the diets of the Australian population, the mean daily calcium intake of ORT patients was similar across both sexes.[39]

Vitamin E is an anti-oxidant in the lipid phase of cell membranes.[21] Inadequate vitamin E intake has been linked to an increased risk of both coronary heart disease and non-alcoholic fatty liver disease.[30,31] These findings of insufficient vitamin E intake in the ORT patient population are supported by the previous research and are substantially low when compared to the Australian compulation.[12,39] Male ORT patients recorded a mean daily intake of 4.5mg daily compared to a mean daily intake of 12.1mg recorded by the Australian population.[39] Similarly, female ORT patients recorded a mean daily intake of 3.6mg, considerably lower than that recorded in the NNPAS of 9.95mg.[39]

Mineral intake also appeared to be highly variable in male and female patients. Levels of sodium intake were disproportionally high in both sexes which may be due to this patient group is consuming excessive amounts of processed 'fast' foods. Sodium is found in most prepared foods as salt and is also present in foods from naturally occurring sodium and from sodium-containing food additives such as sodium bicarbonate.[21] High sodium intake is also associated with elevated blood pressure, a risk factor for cardiovascular and renal diseases.[32] Potassium has been shown to reduce the effects of sodium chloride on blood pressure.[21] The ORT patients' apparent consumption of potassium is below the adequate intake and would potentially not have these beneficial effects and these individuals may be at risk of the

above-mentioned comorbidities. These trends are reflected when comparing the intake of the ORT patients to those of the Australian population. Results show male ORT patients have a considerably higher mean daily sodium intake than Australian males aged 19-50 years (3878.6mg vs. 3017.8mg).[39] Also, ORT patients of both sexes have a slightly lower mean potassium intake than Australians aged 19-50 years.[39]

Low iron intakes recorded in women are also significant. Iron requirements are higher in women due to regular menstruation.[33] Iron intake in males was also low, however protein intake was above the EAR in both sexes. It is suggested that an increased consumption of white meats, which are lower in iron than red meats, may be responsible for this outcome. This result is comparable to the results of Zador *et al*, which showed less than 50% of methadone patients recorded consumption of red meat and had low iron.[9]

Insufficient intake in iron may cause such symptoms as impaired immunity, impaired cognitive function and reduced physical work capacity.[21] Research conducted in Australia and New Zealand examined employment status of methadone patients and found that only 23% of patients held full time employment and 25% of patients were unemployed.[34] This low iron intake may be directly related to not only poor health outcomes for these individuals but a reduced ability to maintain employment.

In both sexes of ORT patients, the mean recorded daily iron intake appears to be less than that of the Australian population with females considerably so.[39] Results from the NNPAS included mean daily iron intake at 13.1mg and 9.7g for males and females respectively.[39] Comparatively, the mean daily iron intake of ORT patients was lower at 9.9mg for males and 6.2mg for females.[39]

These results indicate numerous abnormalities in nutrient consumption due to sub-optimal daily diets in both male and female ORT patients. The use of vitamin and mineral supplements in 7 (27%) females and 5 (18%) males indicates that only a small number of patients may have experienced the effects of or recognised the inadequacy of their diets. However, as all of the patients included in this study who were advised by pharmacists consistently followed the recommendations given and believed the recommendations to be appropriate, it is clear that these individuals value the knowledge of the pharmacist. Previous research has also indicated that nutritional interventions given by community pharmacists to at-risk patient groups have been successful.[35,36] Therefore, there is a potential role for pharmacists to provide nutritional education to ORT patients.

There are limitations to this pilot study. The 24-hour recall method of measuring dietary intake has been shown to be an accurate tool for assessing nutritional consumption. However, this method has it's limitations and there is large variation in the literature as to the number of repetitions of the questionnaire required to ensure accuracy.[13,14,15,22] Recent research supports the use of at least 3 separate recalls performed on varying days of the week to gain an accurate representation of an individual's intake of macro and micronutrients.[14] Research by Keyzer *et al.*[13] compared of the 24-hour recall method measuring intake from two individual days with dietary records taken over five days. This study found that in the context of nutritional surveillance, two 24-hour recalls were less accurate.[13] As only one 24-recall was performed for each participant, this pilot study has a potential for inaccuracy in the form of missreporting. Also, when utilising the Australian NRVs to assess intake, it is recommended these values be applied to intakes assessed over 2-3

days.[21] As a single 24-hour recall was completed and assessing intake over a number of days was not possible the use of NRVs in this research act as a guideline. Also, as no adjustment was made for possible within-person variance, the estimate of percentage of individual's with a recorded intake below the NRV is likely to be greater than the true assessment.

Literature suggests that energy intake is frequently under reported in the first 24-hour recall performed.[23] A recent literature review of 37 papers attempted to determine the accuracy of micronutrient reporting through the 24-hour recall method[37]. This paper found that approximately 30% of individuals under-report and that in these individuals micronutrient density appears to be higher[37]. Also, it has been shown that females underreport during 24-hour recalls significantly more then men[38]. To account for these inaccuracies this paper suggests using an energy adjustment method to decrease the effect of underreported values[37]. Therefore, to account for potential inaccuracy, intake values are able to be increased by 10% and re-assessed. For example, by increasing energy intake by this percentage, mean intake for females in this study becomes 4764.3kJ and males become 8171.1kJ. Results for both sexes remain below the EER. The accuracy of these results however, could be improved in future research through repetition of the methods. Also, direct comparison of intake with each individual's daily requirements through analysis of basal metabolic rate, age, weight, height and body composition would allow for a more accurate discussion of each patients actual requirements. Also, examination of each patient's socioeconomic status in further research may lead to further insight into the potential for cost-led food choices of less nutritionally dense meals. However, such details were not gained in this study as their more invasive nature would be expected to reduce participation. The 24-hour recall is an appropriate standardized technique for

estimation of mean intake of a group, however it is less useful for individual intakes as 1 day of data may not represent actual intake.[10,23] Further research beyond this pilot study including use of objective variables which could validate the nutrient intake data, and an increased number of intake records could improve the accuracy of the results. Also, to extend the current study the data derived from the ORT group needs to be compared with a data set obtained using the same protocol from the general population.

This is the largest study investigating nutrition in ORT patients of both sexes. Previously, the largest research investigating macro and micronutrient intake in both females and males interviewed 48 patients. One study has more participants than this however this research only investigated nutritional intake of females.[9] To our knowledge, this is the first study to investigate the macro and micronutrient intakes of patients attending community pharmacies for ORT. This research therefore assists in gaining an understanding of nutrition in this specific patient group.

This research has demonstrated that male and female ORT patients have inadequate energy intake and are also at risk of insufficient intake of various macro and micronutrients. Furthermore, when compared to the general Australian population, it appears that a number of these inadequacies may be specific to the ORT patient population. Less then a quarter of these patients recorded supplement use to complement dietary intake and therefore may not recognise the inadequacies of their diets. ORT patients are receiving minimal nutritional advice by community pharmacists despite attending pharmacies on a regular (sometimes daily) basis. ORT patients accept and act on nutritional advice given by community pharmacists however it is currently unknown whether this advice is appropriate. Community

pharmacists can therefore potentially increase the beneficial health outcomes in this population through the proactive supply of accurate nutritional advice though further research is warranted to determine whether the nutritional advice provided is accurate. Further research is also needed to determine the whether opportunistic pharmacist-led nutritional education or advice would benefit ORT patients.

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Tables:

Table 1. Mean Intake of macronutrients, moisture and alcohol in male and female opioid replacement therapy patients.

Macronutrients, Moisture & Alcohol	Female	Male	Nutrient Reference Value (/day)
Energy kj/d	4331.21 (2259.5 - 12032.1)	7428.3 (2194.0 – 25252.3)	EER Female: 8100; Male: 10800
% Below EER[§]	33%	36%	
Protein g/d	78.1 (12.3 - 161.9)	135.9 (27.6 - 404.3)	EAR Female: 46; Male: 52
% Below EAR[≠]	30%	6%	
Total Fat Intake g/d	69.9 (2.1 - 156.8)	100.4 (16.8 - 258.5)	No RDI, EAR, AI[†] available.
Carbohydrate g/d (Range)	199.9 (58.7 - 348.2)	287.6 (66.4 - 742.1)	No RDI, EAR, AI available.
Fibre g/d	9.8 (0.0 - 24.3)	13.3 (0.00 - 32.5)	AI Female: 25; Male: 30
% Below AI	100%	97%	
Water mL/d	1543.6 (111.3 - 4200.7)	1906.9 (294.1- 5573.7)	AI Female: 2800; Male: 3400
% Below AI	90%	90%	
Alcohol (E)	1.9	14.6	Recommended Intake ≤5%
% Above Recommended Intake	9%	24%	

†AI: Adequate Intake: The average daily nutrient intake level based on observed or experimentally-determined approximations or estimates of nutrient intake by a group (or groups) of apparently healthy people that are assumed to be adequate.[21]

≠ EAR: Estimated Average Requirement: A daily nutrient level estimated to meet the requirements of half the healthy individuals in a particular life stage and gender group.[21]

§ EER: Estimated Energy Requirement: The average dietary energy intake that is predicted to maintain energy balance in a healthy adult of defined age, gender, weight, height and level of physical activity, consistent with good health.[21]

Table 2. Mean intake of vitamins in female and male opioid replacement therapy patients.

Vitamins	Female	Male	Nutrient Reference Value
Thiamin mg/d	0.9 (0.0 - 2.5)	1.3 (0.0 - 4.8)	EAR Female: 0.9; Male: 1.0
% Below EAR≠	61%	40%	
Riboflavin mg/d	1.9 (0.1 - 8.5)	2.6 (0.0 - 9.1)	EAR Female: 0.9; Male: 1.1
% Below EAR	18%	12%	
Vitamin C mg/d	90.5 (0.0 -	59.5 (0.0 -	EAR Female: 30; Male: 30
% Below EAR	588.9)	220.4)	
	45%	40%	
Vitamin E mg/d	3.6 (0.0 - 16.0)	4.5 (0.0 - 17.6)	AI Female: 7; Male: 10
% Below AI	79%	91%	
Folate µg/d	225.9 (22.1 -	245.7 (0.2 -	EAR Female: 320; Male: 320
% Below EAR	771.2)	685.3)	
	79%	70%	
Vitamin A µg/d	552.1 (0.0 -	702.1 (0.8 -	EAR Female: 500; Male: 625
% Below EAR	1684.4)	3082.5)	
	55%	61%	

†AI: Adequate Intake: The average daily nutrient intake level based on observed or experimentally-determined approximations or estimates of nutrient intake by a group (or groups) of apparently healthy people that are assumed to be adequate.[21]

≠ EAR: Estimated Average Requirement: A daily nutrient level estimated to meet the requirements of half the healthy individuals in a particular life stage and gender group.[21]

Table 3. Mean intake of minerals in female and male opioid replacement therapy

patients.

Minerals	Female	Male	Nutrient Reference Value
Sodium mg/d	1983.7 (438.8 - 4814.6)	3878.6 (455.4 - 8156.1)	AI Female: 260-920; Male: 260-920
% Below AI†	3%	3%	
Potassium mg/d	2152.8 (355.0 - 6001.9)	3017.8 (21.6 - 1861.1)	AI Female: 2800; Male: 3800
% Below AI	67%	76%	
Magnesium mg/d	286.6 (42.9 - 1362.1)	380.1 (1.9- 1275.1)	EAR Female: 265; Male: 350
% Below EAR≠	55%	55%	
Calcium mg/d	722.3 (66.3 - 3028.8)	1052.0 (10.8 - 3430.5)	EAR Female: 840; Male: 840
% Below EAR	73%	46%	
Phosphorus mg/d	1121.2 (206.8 - 3228.8)	1826.2 (589.9- 3985.8)	AI Female: 580; Male: 580
% Below AI	21%	0%	
Iron mg/d	6.2 (0.4 - 19.5)	9.9 (7.9 - 6.6)	EAR Female: 8; Male: 6
% Below EAR	70%	30%	
Zinc mg/d	7.2 (0.9 - 14.3)	13.2 (0.0 - 50.6)	EAR Female: 6.5; Male: 12
% Below EAR	49%	58%	
Iodine µg/d	113.3 (5.5 - 663.9)	160.25 (0.4 - 554.1)	EAR Female: 100; Male: 100
% Below EAR	58%	30%	

†AI: Adequate Intake: The average daily nutrient intake level based on observed or experimentally-determined approximations or estimates of nutrient intake by a group (or groups) of apparently healthy people that are assumed to be adequate.[21]

≠ EAR: Estimated Average Requirement: A daily nutrient level estimated to meet the requirements of half the healthy individuals in a particular life stage and gender group.[21]